Ref. 8

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-351998
(43)Date of publication of application : 21.12.2001

(51)Int.Cl. H01L 23/02 H01L 23/20
H01L 31/02

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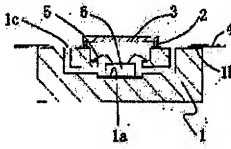
(22)Date of filing : 09.06.2000 (72)Inventor : KINOMURA KOJI

(54) PACKAGE FOR SEMICONDUCTOR DEVICE



(57)Abstract:
PROBLEM TO BE SOLVED: To improve the coupling efficiency of a light-receiving semiconductor device and the external light, and to operate the semiconductor device in a normal and stable state over a long time by effectively preventing inert gas from adhering to the inside (recessed side) of a cover.
SOLUTION: Two through holes 1c are formed from the top surface of a body 1 to the inside surface of a recess and the openings of the through holes 1c made in the inside surface of the depression are disposed facing each other, on the extension of a diagonal line of a semiconductor device 6.

Jpn. Pat. Appln. KOKAI Publication 2001-351998

SP Number : B0005P0903

(English Documments Translated by Translation Software)

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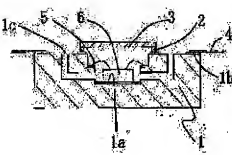
PROBLEM TO BE SOLVED: To improve the coupling efficiency of a light-receiving semiconductor device and the external light, and to operate the semiconductor device in a normal and stable state over a long time by effectively preventing inert gas from adhering to the inside (recessed side) of a cover.



SOLUTION: Two through holes 1c are formed from the top surface of a body 1 to the inside surface of a recess and the openings of the through holes 1c made in the inside surface of the depression are disposed facing each other, on the extension of a diagonal line of a semiconductor device 6.

CLAIMS

[Claim(s)]

[Claim 1]A base in which a placing part which a crevice is formed in the upper surface and lays a semiconductor device of rectangular shape in this recessed bottom face was provided.

A lid which covered said crevice and was joined to said upper surface so that a translucency member might be provided in the principal surface and said semiconductor device might be closed.

While being the package for semiconductor device storage provided with the above and forming two breakthroughs penetrated from the upper surface of said base applying to a medial surface of said crevice, each opening by the side of said medial surface of this breakthrough is countered and provided on extension wire of an abbreviated diagonal line of said semiconductor device, respectively.

[Claim 2]The package for semiconductor device storage according to claim 1, wherein each opening lower end by the side of said medial surface of said breakthrough is established in height from this upper surface to 5 mm more highly than the upper surface of said semiconductor device.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention CCD (Charge Coupled Device), It is related with the package for semiconductor device storage which stores the emitted-light type semiconductor device of the various light-receiving type semiconductor device of PD (Photo Diode), EPROM (Erasable Programmable ROM), etc., or LD (Laser Diode) inside.

[0002]

[Description of the Prior Art]The conventional package for semiconductor device storage (henceforth a semiconductor package) which stores the various light-receiving type semiconductor device of CCD, PD, EPROM, etc. inside is shown in drawing 3. The base in which 11 comprises ceramics, such as alumina ($aluminum_2O_3$) ceramics and alumimium nitride (AlN) ceramics, in the figure. The seal ring in which 12 comprises metallic materials, such as an iron (Fe)-nickel (nickel)-cobalt (Co) alloy, 13 is the lid which attached the metallic frame in which it changes from metallic materials, such as a Fe-Ni-Co alloy, to the edge part of the translucency member which comprises sapphire glass etc., and at least two breakthroughs are provided. The received type

semiconductor device 16 of light is stored inside a semiconductor package by these bases 11, SHIRIRUNGU 12, and the lid 13.

[0003]The base 11 comprises ceramics and has a crevice on the upper surface. The base 11 functions as a fixed mounting member which has the placing part 11a which carries out fixed mounting of the received-light type semiconductor device 16 in the internal base of a crevice, and kinds, such as construction material of the base 11, are suitably selected according to the electrical property of the semiconductor device 16, etc.

[0004]Covering formation of the metallized layer 11b is carried out to the field where the placing part 11a of the semiconductor device 16 and the seal ring 12 are joined, the field where the lead terminal 14 is joined, the field where the bonding wire 15 is joined, etc., and it functions on this base 11 as an electrical link layer or a metallizing joining layer.

[0005]The seal ring 12 comprises metallic materials, such as a Fe-Ni-Co alloy, and it is joined to the base 11 upper surface with filter media, such as silver solder, so that the placing part 11a and crevice of the semiconductor device 16 may be surrounded.

[0006]The lid 13 joins the metallic frame in which a Fe-NI-Co alloy etc. are comprised, it applies to the undersurface from the upper surface via the metal membrane formed in the edge part of translucency members, such as sapphire glass, and the breakthrough 11c is formed with low melting point filter media, such as golden (Au)-tin (Sn).

[0007]At least two or more of these breakthroughs 11c are provided as a suction hole and an exhaust hole as an object for the channels of inactive gas, such as nitrogen (N_2) gas enclosed with the inside of the crevice of the base 11. When the breakthrough 11c is not formed in the lid 13, even if inactive gas is enclosed with the inside of the crevice of the base 11 and it closes airtightly, Inactive gas ionizes by lights, such as ultraviolet rays, and it deteriorates, and the gas which deteriorated adheres to the inner surface side of the lid 13 which comprises a translucency member, and the light transmittance state of the lid 13 is in the disadvantage tendency to break.

[0008]It has the function for the pipe for inactive gas circulation to be connected to this breakthrough 11c, and to make it circulate through inactive gas from the exterior.

[0009]Thus, by the base 11, the seal ring 12, and the lid 13, while accommodating the semiconductor device 16 in the inside of a semiconductor package, the semiconductor

device 16 is airtightly accommodated in the inside of a semiconductor package by connecting the pipe for inactive gas circulation to the breakthrough 11c. By electrically connecting the bonding wire 15, the lead terminal 14, and the semiconductor device 16, and carrying out light transmission from the outside through the lid 13 of a translucency member, The semiconductor device 16 serves as a semiconductor device which can receive the light, and can operate, can carry out conversion to signals of the external image, or can perform elimination etc. of the signal memorized by the semiconductor device 16 and data good.

[0010]

[Problem(s) to be Solved by the Invention]However, since the breakthrough 11c is formed in the lid 13 upper surface, When the size of the semiconductor device 16 is larger than the area of a translucency member, it interferes with outdoor daylight, such as ultraviolet rays, being irradiated by the semiconductor device 16, It had a problem of coupling efficiency of the light of outdoor daylight and the semiconductor device 16 not being spoiled, and fully being unable to eliminate a signal, data, etc. which are memorized by the semiconductor device 16.

[0011]Inactive gas is supplied from 13 copies of upper parts in the crevice of the base 11, i.e., a lid, and since it has structure similarly discharged from the upper part in a crevice, it becomes easy to stagnate, without inactive gas circulating the inside of a crevice uniformly. Therefore, this inactive gas deteriorated by outdoor daylight, and it adhered to the inner surface side (crevice side) of the lid 13, and had the problem that the semiconductor device 16 could not fully be irradiated with outdoor daylight.

[0012]Therefore, it was completed in view of the above-mentioned problem, and this invention the purpose, By preventing effectively that can fully irradiate the semiconductor device 16 with outdoor daylight, and inactive gas stagnates by base 11 inside, It is in providing the semiconductor package which can fully eliminate the signal which makes good coupling efficiency of the semiconductor device 16 and outdoor daylight, and is written in the semiconductor device 16, data, etc.

[0013]

[Means for Solving the Problem]A base in which a placing part to which a crevice is

formed in the upper surface and a package for semiconductor device storage of this invention lays a semiconductor device of rectangular shape in this recessed bottom face was provided, In a package for semiconductor device storage possessing a lid which covered said crevice and was joined to said upper surface so that a translucency member might be provided in the principal surface and said semiconductor device might be closed, While two breakthroughs penetrated from the upper surface of said base applying to a medial surface of said crevice are formed, each opening by the side of said medial surface of this breakthrough is countered and provided on extension wire of an abbreviated diagonal line of said semiconductor device, respectively.

[0014]By such composition, even if this invention is a semiconductor device of what kind of size, it can fully irradiate with outdoor daylight, and it can circulate through inactive gas inside a base good. Therefore, elimination of a signal currently written in coupling efficiency and a semiconductor device of a semiconductor device and outdoor daylight, data, etc. can be performed with sufficient thing, and a semiconductor device may be operated normally and stably over a long period of time.

[0015]In this invention, each opening by the side of said medial surface of said breakthrough is preferably provided in height from this upper surface to 5 mm more highly than the upper surface of said semiconductor device.

[0016]By the above-mentioned composition, inactive gas can be promptly supplied uniformly in a crevice of a base from a breakthrough, and it can discharge promptly.

[0017]

[Embodiment of the Invention]The semiconductor package of this invention is explained in detail below. Drawing 1 is a sectional view showing one embodiment of the semiconductor package of this invention, and drawing 2 is a plan of the base of drawing 1 except a lid. As for 1, in these figures, a seal ring and 3 are lids a base and 2. The container which stores the semiconductor device 6 inside comprises these bases 1, the seal ring 2, and the lid 3.

[0018]The base 1 changes from various ceramics which have a crevice, such as alumina ceramics and alumimium nitride ceramics, to the upper surface, It functions as a fixed mounting member which has the placing part 1a which carries out fixed mounting of the

semiconductor device 6 of rectangular shape in a recessed bottom face, and kinds, such as construction material of the base 1, are suitably selected according to the electrical property of the semiconductor device 6, etc.

[0019]The shape in the plane view of the semiconductor device 6 is a thing of rectangular shape, such as an approximately rectangle and an approximately square, In this case, by countering and providing each opening by the side of the medial surface of the crevice of two breakthroughs of this invention on the extension wire of the abbreviated diagonal line of the semiconductor device 6, the channel of inactive gas becomes is easy to be formed, and that stagnation can be controlled. That is, in the corner by the side of the opening for inhalation of air of the semiconductor device 6, inactive gas is divided into right and left by a corner, a channel is formed, and in the corner by the side of the opening for exhaust air of the semiconductor device 6, the separated inactive gas gathers and becomes that it results and is easy to be exhausted to a breakthrough. Since inactive gas is supplied also to the upper part of the semiconductor device 6 in part, it is uniformly supplied promptly in a crevice and becomes that it is easy to be exhausted promptly.

[0020]In order to enable circulation of inactive gas, such as nitrogen gas enclosed with this base 1 in order to close the semiconductor device 6 airtightly, at least two breakthroughs 1c which the metallized layer 1b of the base 1 upper surface penetrates from the part by which covering formation is not carried out applying to the crevice medial surface of the base 1 are formed. And while each opening by the side of two crevice medial surfaces of the breakthrough 1c is countered and provided on the extension wire of the abbreviated diagonal line of the semiconductor device 6 and they have a function as the suction hole and exhaust hole of inactive gas, It has what is called an inerting function to prevent inactive gas from stagnating in the crevice of the base 1 effectively.

[0021]The pipe shape metal fittings (not shown) which comprise a Fe-Ni-Co alloy alloy etc. are joined with filter media, such as silver solder, via a metallized layer so that this breakthrough 1c may cover the opening by the side of the base 1 upper surface. That is, it is connectable with the pipe shape metal fittings as a pipe for inactive gas circulation.

[0022]As for this breakthrough 1c, it is preferred that the opening by the side of the medial surface of the crevice of the base 1 is provided in a 0.1-7-mm-high position from a recessed bottom face while the opening by the side of that base 1 upper surface is provided in the position which is separated from the crevice upper bed corner of the base 1 5-30 mm.

[0023]As for the opening lower end by the side of the medial surface of the crevice of the breakthrough 1c, as shown in drawing 4, being provided in mist or the upper part is more preferred than the accommodated semiconductor device 6. That is, each opening lower end by the side of the medial surface of the crevice of the breakthrough 1c is good to be provided in the height from the upper surface to 5 mm more highly than the upper surface of the semiconductor device 6. If it exceeds 5 mm from the upper surface of the semiconductor device 6, it will become difficult for inactive gas to become difficult to enter the side of the semiconductor device 6, and to supply inactive gas uniformly in [whole] a crevice. In order to establish an opening lower end in such height, the thickness of the base 1 is unsuitable at the point which becomes thick unnecessarily. When each opening lower end becomes the height below the upper surface of the semiconductor device 6, the channel of inactive gas is barred by the side (end face) of the semiconductor device 6, and it is in the tendency for inactive gas to stagnate in a crevice.

[0024]This breakthrough 1c has a preferred way whose horizontal length it is a size in which that inside diameter is about 0.2-2 mm, and the height of that perpendicular direction is about 0.2-5 mm, and is about 5-30 mm at the point as for which circulation of inactive gas is made more to fitness.

[0025]When such a base 1 comprises alumina ceramics, for example, an aluminum oxide (aluminum$_2O_3$), An organic binder suitable in the end of precursor powder, such as oxidized silicon (SiO_2), magnesium oxide (MgO), and a calcium oxide (CaO), This paste is accomplished with a ceramic green sheet by adopting a doctor blade method and the calendering roll method by carrying out addition mixing of the solvent etc. and creating a paste. In order to carry out covering formation of the metallized layer 1b to the base 1 after an appropriate time, While carrying out print coating of the metal paste, such as

molybdenum (Mo)–manganese (Mn) and tungsten (W), to the field where the placing part 1a of the semiconductor device 6 and the bonding wire 5 are joined, the field where the lead terminal 4 is joined, etc., Suitable punching processing for this ceramic green sheet is performed, two or more [of these] are laminated, and it is manufactured by calcinating at the temperature of about 1600 **.

[0026]In the case of molybdenum manganese, the metal paste which accomplishes this metallized layer 1b is obtained by carrying out addition mixing of molybdenum, the suitable organic binder for high–melting point metal powder like manganese, the solvent, etc., for example.

[0027]the metal which excels [metallized layer / 1b / this] in corrosion resistance on that surface, and is excellent in wettability with a filter medium, if a 0.5–9–micrometer–thick nickel (nickel) layer is made to specifically laminate with plating, It functions as what is called a metallizing joining layer that enables junction by filter media, such as silver solder of the base 1, and the seal ring 2 and the lead terminal 4, and junction by the low melting point solder of tin (Sn)–lead (Pb) Hitoshi Handa of the semiconductor device 6 and the placing part 1a. It functions as an electrical junction layer which makes possible the electrical link of the semiconductor device 6 and the bonding wire 5 by making a 0.5–9–micrometer–thick gold layer laminate on the surface of this nickel layer with plating further.

[0028]By the seal ring's 2 comprising metallic materials, such as a Fe–Ni–Co alloy, and using what was approximated to the coefficient of thermal expansion of the base 1, Distortion by the thermal expansion difference after joining with filter media, such as silver solder, is made very small so that the mounting portion 1a and a crevice may be surrounded on the upper surface of the base 1, and as a result, junction of them can be performed with a firm thing.

[0029]This seal ring 2 is manufactured by predetermined shape by performing metal processing of the conventional common knowledge, such as strip processing and punching processing, to that ingot. The metal and the junction by silver solder with the base 1 upper surface, etc. if the 0.5–9–micrometer–thick nickel layer is made to specifically laminate with plating etc. which are excellent in corrosion resistance on the

surface, and are excellent in wettability with a filter medium can be performed with a firmer thing.

[0030]The lid 3 which joined the metallic frame which comprises a Fe-Ni-Co alloy etc. is joined to this seal ring 2 upper surface by welding of seam welding etc. via the metal membrane formed in the edge part of the translucency member which comprises sapphire glass etc.

[0031]This lid 3 covers a crevice and is joined to the upper surface of the base 1 so that a translucency member may be provided in the window part which was able to be opened in that principal surface and the semiconductor device 6 may be closed. While having a function which closes by this the semiconductor device 6 stored inside airtightly, it has the function as what is called a light transmission window to make a translucency member penetrate outdoor daylight, such as ultraviolet rays, and to transmit outdoor daylight to the semiconductor device 6. The lid 3 whole may comprise translucency members, such as sapphire glass.

[0032]Since that coefficient of thermal expansion is about $5x10^{-6}$/** (room temperature -400 **) when the translucency member of this lid 3 comprises sapphire glass, A coefficient of thermal expansion with the metallic frame in which a coefficient of thermal expansion comprises the Fe-Ni-Co alloy about $4x10^{-6}$ - $5x10^{-6}$/** (room temperature -400 **) approximates, and those junction can be performed with a very firm thing.

[0033]The metallic frame of this lid 3 is manufactured by predetermined shape by performing metal processing of the conventional common knowledge, such as strip processing and punching processing, to that ingot. [make / the metal which is excellent in corrosion resistance on the surface, and is excellent in wettability with a filter medium, and / a 0.5-9-micrometer-thick nickel layer and a 0.5-9-micrometer-thick gold layer / specifically laminate with plating] It is firmly joined to the metal membrane of the edge part of a translucency member with low melting point filter media, such as golden (Au)-tin (Sn).

[0034]Since the breakthrough 1c for inactive gas circulation formed [that inactive gas deteriorates by the outdoor daylight by ultraviolet rays etc., and the translucency member of this lid 3 adheres to the inner surface side (crevice side) of the translucency

member of the lid 3 and] in the base 1 prevents effectively, a very highly transparent state is maintainable.

[0035]Thus, the outdoor daylight which penetrates the translucency member of the lid 3 is fully irradiated by the semiconductor device 6 of whether he would like to be stored in a crevice, and the becoming size, without deteriorating the inactive gas in the crevice of the base 1. Therefore, elimination of the signal which can fully secure the coupling efficiency of the semiconductor device 6 and outdoor daylight, and is memorized by the semiconductor device 6, data, etc. can be performed with sufficient thing, and, as a result, the semiconductor device 6 may be operated normally and stably over a long period of time.

[0036]The base 1 in which the placing part 1a to which a crevice is formed in the upper surface and the semiconductor package of this invention lays the semiconductor device 6 of rectangular shape in a recessed bottom face was formed in this way, In order to enable circulation of inactive gas, such as nitrogen gas, argon gas, etc. which were enclosed in order to provide the lid 3 of the translucency which covers a crevice and is joined to the upper surface so that the semiconductor device 6 may be closed, and to close the semiconductor device 6 airtightly, While at least two breakthroughs 1c penetrated from the upper surface of a base applying to the medial surface of a crevice are formed, each opening by the side of two medial surfaces of the breakthrough 1c is countered and provided on the extension wire of the abbreviated diagonal line of the semiconductor device 6.

[0037]It can be effectively prevented from inactive gas deteriorating by the outdoor daylight by ultraviolet rays etc., and adhering to the inner surface side of the translucency member of the lid 3 by this, and the lid 3 which has the translucency member which maintained the very highly transparent state can be obtained. As a result, the semiconductor device 6 may be operated normally and stably over a long period of time by the outdoor daylight which penetrates this lid 3.

[0038]Thus, by the base 1, the seal ring 2, and the lid 3, while accommodating the semiconductor device 6 in the inside of a semiconductor package, By connecting the pipe for inactive gas circulation to the breakthrough 1c, the semiconductor device 6 is

airtightly accommodated in the inside of a semiconductor package, and inactive gas may be circulated in the crevice of the base 1. By electrically connecting the bonding wire 5, the lead terminal 4, and the semiconductor device 6, and making outdoor daylight penetrate through the translucency member of the lid 3 from the exterior, The semiconductor device 6 serves as a semiconductor device which can receive the outdoor daylight, and can operate, can incorporate and carry out conversion to signals of the external image, or can perform elimination etc. of the signal which is written in the semiconductor device 6 and memorized, data, etc. good.

[0039]It is convenient to make various change within limits which this invention is not limited to the above-mentioned embodiment, and do not deviate from the gist of this invention at all.

[0040]For example, the breakthrough 1c may be formed so that the metallized layer 1b may be missing from the inside of the base 1 and may penetrate from the flank of the base 1 by which covering formation is not carried out, In this case, while the working efficiency processed into the ceramic green sheet laminated for forming the breakthrough 1c becomes good, when connecting the pipe for inactive gas circulation, this pipe for inactive gas circulation contacts the lid 3 and the lead terminal 4, and becomes easy to avoid the danger of damaging them.

[0041]The semiconductor device 6 of this invention may be an emitted-light type thing of not only the received-light type thing of CCD, PD, EPROM, etc. but LD (semiconductor laser) etc.

[0042]

[Effect of the Invention]While two breakthroughs penetrated from the upper surface of a base applying to the medial surface of a crevice are formed, this invention, By countering and providing each opening by the side of the medial surface of the crevice of a breakthrough on the extension wire of the abbreviated diagonal line of a semiconductor device, respectively, It can be effectively prevented from inactive gas deteriorating by the outdoor daylight by ultraviolet rays etc., and adhering to the inner surface side of the translucency member of a lid, and the lid which has the translucency member which maintained the very highly transparent state can be obtained. As a result, a

semiconductor device may be operated normally and stably over a long period of time by the outdoor daylight which penetrates this lid.

[0043]By being provided in the height from the upper surface to 5 mm more highly than the upper surface of a semiconductor device, this invention supplies inactive gas uniformly promptly in the crevice of a base from a breakthrough, and tends to discharge promptly each opening lower end by the side of the medial surface of the crevice of a breakthrough.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a sectional view showing one embodiment of the semiconductor package of this invention.

[Drawing 2]It is a top view of the base except the lid of drawing 1.

[Drawing 3]It is a sectional view of the conventional semiconductor package.

[Drawing 4]It is a sectional view showing other embodiments of the semiconductor package of this invention.

[Description of Notations]

1: Base

1a: Placing part

1c: Breakthrough

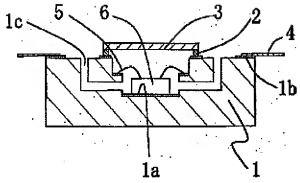
2: Seal ring

3: Lid

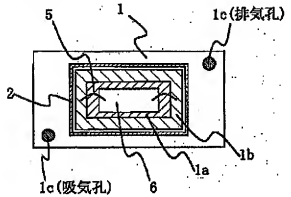
6: A received-light type semiconductor device

DRAWINGS

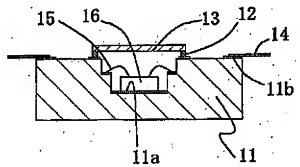
[Drawing 1]



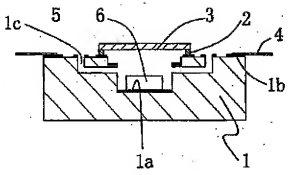
[Drawing 2]



[Drawing 3]



[Drawing 4]


1c
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1b
1a
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Ref.8

対応なし、英抄

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2001－351998
（Ｐ2001－351998Ａ）
(43)公開日　平成13年12月21日(2001.12.21)

(51)Int.Cl.'	識別記号	ＦＩ		テーマコード(参考)
Ｈ01Ｌ 23/02		Ｈ01Ｌ 23/02	Ｇ	5Ｆ088
			Ｆ	
23/20		23/20		
31/02		31/02	Ｂ	

審査請求　未請求　請求項の数２　ＯＬ　（全６頁）

(21)出願番号　特願2000－173414(Ｐ2000－173414)

(22)出願日　平成12年６月９日(2000.6.9)

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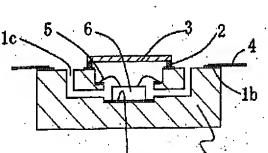
Ｆターム(参考)　5Ｆ088 AA01 BA10 JA05 JA10 JA20

(54)【発明の名称】　半導体素子収納用パッケージ

(57)【要約】
【課題】　変質した不活性ガスが蓋体の内面側（凹部側）に付着するのを有効に防止することによって、受光型の半導体素子と外光との結合効率を良好なものとし、半導体素子を長期間にわたり正常かつ安定に作動させること。
【解決手段】　基体１の上面から凹部の内側面にかけて貫通する２つの貫通孔１ｃが形成されるとともに、貫通孔１ｃの凹部の内側面側の各開口がそれぞれ半導体素子６の略対角線の延長線上に対向して設けられている。



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［特許請求の範囲］

［請求項１］上面に凹部が形成され，該凹部底面に方形状の半導体素子を載置する載置部が設けられた基体と，主面に透光性部材が設けられ，かつ前記半導体素子を封止するように前記凹部を覆って前記上面に接合された蓋体とを具備した半導体素子収納用パッケージにおいて，前記基体の上面から前記凹部の内側面にかけて貫通する２つの貫通孔が形成されるとともに，該貫通孔の前記内側面側の各開口がそれぞれ前記半導体素子の略対角線の延長線上に対向して設けられていることを特徴とする半導体素子収納用パッケージ。

【請求項２】前記貫通孔の前記内側面側の各開口下端は，前記半導体素子の上面よりも高くかつ該上面から５ｍｍまでの高さに設けられていることを特徴とする請求項１記載の半導体素子収納用パッケージ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は，ＣＣＤ（Charge Coupled Device），ＰＤ（Photo Diode），ＥＰＲＯＭ（Erasable Programmable ＲＯＭ）等の各種受光型の半導体素子，またはＬＤ（Laser Diode）等の発光型の半導体素子を内部に収納する半導体素子収納用パッケージに関する。

【０００２】

【従来の技術】ＣＣＤ，ＰＤ，ＥＰＲＯＭ等の各種受光型の半導体素子を内部に収納する従来の半導体素子収納用パッケージ（以下，半導体パッケージという）を図３に示す。同図において，１１はアルミナ（Al_2O_3）セラミックスや窒化アルミニウム（ＡｌＮ）セラミックス等のセラミックスから成る基体，１２は鉄（Ｆｅ）－ニッケル（Ｎｉ）－コバルト（Ｃｏ）合金等の金属材料から成るシーリング，１３はサファイアガラス等から成る透光性部材の周縁部にＦｅ－Ｎｉ－Ｃｏ合金等の金属材料から成り，貫通孔が少なくとも２ヶ所設けられている金属フレームを取着した蓋体である。これらの基体１１，シーリング１２，蓋体１３とで，受光型半導体素子１６を半導体パッケージ内部に収納する。

【０００３】基体１１はセラミックスから成り，その上面に凹部を有する。また，基体１１は，受光型の半導体素子１６を載置固定する載置部１１ａを凹部の内部底面に有する載置固定部材として機能し，基体１１の材質等の種類は半導体素子１６の電気特性等に応じて適宜選定される。

【０００４】また，この基体１１には，メタライズ層１１ｂが半導体素子１６の載置部１１ａ，シーリング１２が接合される面，リード端子１４が接合される面，ボンディングワイヤ１５が接合される面等に被着形成され，電気的接続層やメタライズ接合層として機能する。

【０００５】シーリング１２は，Ｆｅ－Ｎｉ－Ｃｏ合金等の金属材料から成り，基体１１上面に，半導体素子

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１６の載置部１１ａおよび凹部を囲繞するように銀ロウ等のロウ材で接合される。

【０００６】蓋体１３は，サファイアガラス等の透光性部材の周縁部に形成された金属膜を介して，Ｆｅ－Ｎｉ－Ｃｏ合金等から成り上面から下面にかけて貫通孔１１ｃが設けられている金属フレームを，金（Ａｕ）－錫（Ｓｎ）等の低融点ロウ材で接合したものである。

【０００７】この貫通孔１１ｃは，基体１１の凹部内部に封入された窒素（N_2）ガス等の不活性ガスの流路用として，吸気孔および排気孔として少なくとも２つ以上設けられる。蓋体１３に貫通孔１１ｃが設けられていない場合，基体１１の凹部内部に不活性ガスを封入し気密に封止しても，紫外線等の光により不活性ガスがイオン化等して変質し，その変質したガスが透光性部材から成る蓋体１３の内面側に付着し蓋体１３の光透過性が損なわる傾向にある。

【０００８】また，この貫通孔１１ｃには，外部より不活性ガス循環用パイプが接続され不活性ガスを循環させる機能を有する。

【０００９】このように，基体１１，シーリング１２，蓋体１３とで，半導体素子１６を半導体パッケージ内部に収容するとともに，貫通孔１１ｃに不活性ガス循環用パイプを接続することによって，半導体素子１６が半導体パッケージ内部に気密に収容される。また，ボンディングワイヤ１５とリード端子１４と半導体素子１６とを電気的に接続し，透光性部材の蓋体１３を通して外部から光透過させることによって，半導体素子１５がその光を受信し作動したり，外部の映像を信号化したり，半導体素子１６に記憶されている信号，データの消去等を良好に行うことができる半導体装置となる。

【００１０】【発明が解決しようとする課題】しかしながら，貫通孔１１ｃが蓋体１３上面に設けられているため，半導体素子１６の大きさが透光性部材の面積よりも大きい場合，紫外線等の外光が半導体素子１６に照射されるのに支障をきたし，外光と半導体素子１６との光の結合効率が損なわれり，また，半導体素子１６に記憶されている信号，データ等の消去を十分に行うことができない等の問題点を有していた。

【００１１】また，不活性ガスが基体１１の凹部内の上側から，即ち蓋体１３部から供給され，同じく凹部内の上側から排出される構造となっているため，不活性ガスが凹部内を構造なく流通することなく滞留し易くなる。そのため，この不活性ガスが外光により変質し，蓋体１３の内面側（凹部側）に付着して，半導体素子１６に外光を十分に照射できないという問題点を有していた。

【００１２】従って，本発明は上記問題点に鑑み完成されたもので，その目的は，外光を半導体素子１６に十分に照射でき，且つ基体１１内部で不活性ガスが滞留するのを有効に防止することによって，半導体素子１６と外

光との結合効率を良好なものとし、また半導体素子１６に蓄き込まれている信号，データ等の消去を十分に行うことができる半導体パッケージを提供することにある。

【００１３】

【課題を解決するための手段】本発明の半導体素子収納用パッケージは、上面に凹部が形成され、該凹部底面に方形状の半導体素子を載置する載置部が設けられた基体と、主面に透光性部材が設けられ、かつ前記半導体素子を封止するように前記凹部を覆って前記上面に接合された蓋体とを具備した半導体素子収納用パッケージにおいて、前記基体の上面から前記凹部の内側面にかけて貫通する２つの貫通孔が形成されるとともに、該貫通孔の前記内側面側の各開口がそれぞれ前記半導体素子の略対角線の延長線上に対向して設けられていることを特徴とする。

【００１４】本発明は、このような構成によって、いかなる大きさの半導体素子であっても十分に外光を照射でき、また基体内部の不活性ガスの循環を良好に行うことができる。そのため、半導体素子と外光との結合効率や半導体素子に蓄き込まれている信号，データ等の消去を十分なものとでき、半導体素子を長期間にわたり正常かつ安定に作動させ得る。

【００１５】本発明において、好ましくは、前記貫通孔の前記内側面側の各開口は、前記半導体素子の上面よりも高くかつ該上面から５ｍｍまでの高さに設けられていることを特徴とする。

【００１６】上記の構成により、不活性ガスを貫通孔より基体の凹部内に速やかに循環なく供給でき、また速やかに排出することができる。

【００１７】

【発明の実施の形態】本発明の半導体パッケージについて以下に詳細に説明する。図１は本発明の半導体パッケージの一実施形態を示す断面図であり、図２は蓋体を除く図１の基体の上面図である。これらの図において、１は基体、２はシールリング、３は蓋体である。これら基体１，シールリング２，蓋体３とで半導体素子６を内部に収納する容器が構成される。

【００１８】基体１は、上面に凹部を有するアルミナセラミックスや窒化アルミニウムセラミックス等の各種セラミックスから成り、方形状の半導体素子６を載置固定する載置部１ａを凹部底面に有する載置固定部材として機能し、基体１の材質等の種類は半導体素子６の電気特性等に応じて適宜選定される。

【００１９】なお、半導体素子６の平面視における形状は略長方形，略正方形等の方形状のものであり、この場合、本発明の２つの貫通孔の凹部の内側面側の各開口が、半導体素子６の略対角線の延長線上に対向して設けられていることにより、不活性ガスの流路が形成され易くなり、その循環を抑制することができる。即ち、半導体素子６の吸気用開口側の角部において、不活性ガスが角部で左右に分離されて流路を形成し、半導体素子６の排気用開口側の角部において、分離された不活性ガスは集合し貫通孔へ至り排気され易くなる。また、不活性ガスは半導体素子６の上方へも一部供給されるので、凹部内に満遍なく速やかに供給され、速やかに排気され易くなる。

【００２０】また、この基体１には、半導体素子６を気密に封止するために封入した窒素ガス等の不活性ガスの循環を可能にするために、基体１上面のメタライズ層１ｂが被着形成されていない部位から基体１の凹部内側面にかけて貫通する貫通孔１ｃが少なくとも２つ設けられる。そして、２つの貫通孔１ｃの凹部内側面側の各開口が半導体素子６の略対角線の延長線上に対向して設けられており、それらは不活性ガスの吸気孔および排気孔としての機能を有するとともに、基体１の凹部内に不活性ガスが滞留するのを有効に防止する所謂不活性ガス置換機能を有する。

【００２１】この貫通孔１ｃは、基体１上面側の開口を覆うように、Ｆｅ－Ｎｉ－Ｃｏ合金合金等から成るパイプ状金具（図示せず）がメタライズ層を介して銀ロウ等のロウ材で接合される。即ち、不活性ガス循環用パイプとしてのパイプ状金具に接続可能となっている。

【００２２】また、この貫通孔１ｃは、その基体１上面側の開口が基体１の凹部上婚角部から５～３０ｍｍ離れた位置に設けられるとともに、基体１の凹部の内側面側の開口が凹部底面から０．１～７ｍｍの高さの位置に設けられることが好ましい。

【００２３】なお、貫通孔１ｃの凹部の内側面側の開口下端は、図４に示すように、収容された半導体素子６よりもやや上側に設けられることが好ましい。即ち、貫通孔１ｃの凹部の内側面側の各開口下端は、半導体素子６の上面よりも高くかつその上面から５ｍｍまでの高さに設けられていることがよい。半導体素子６の上面から５ｍｍを超えると、不活性ガスが半導体素子６の側面に入り込みにくくなり、凹部内の全体に不活性ガスを満遍なく供給することが難しくなる。また、そのような高さに開口下端を設けるために基体１の厚みが不要に厚くなってしまう点で不適である。各開口下端が半導体素子６の上面以下の高さになると、不活性ガスの流路が半導体素子６の側面（壁面）により妨げられ、凹部内で不活性ガスが滞留する傾向にある。

【００２４】また、この貫通孔１ｃは、その内径が０．２～２ｍｍ程度の大きさで、また、その垂直方向の高さが０．２～５ｍｍ程度、水平方向の長さが５～３０ｍｍ程度であるほうが、不活性ガスの循環を良好にできる点で好ましい。

【００２５】このような基体１が，例えばアルミナセラミックスから成る場合，酸化アルミニウム（Ａｌ$_2$Ｏ$_3$），酸化珪素（ＳｉＯ$_2$），酸化マグネシウム（ＭｇＯ），酸化カルシウム（ＣａＯ）等の原料粉末に適当

な有機バインダ、溶剤等を添加混合してペーストを作成し、このペーストをドクターブレード法やカレンダーロール法を採用することによって、セラミックグリーンシートと成す。しかる後、基体１にメタライズ層１ｂを被着形成するために、半導体素子６の載置部１ａ、ボンディングワイヤ５が接合される面、リード端子４が接合される面等にモリブデン（Ｍｏ）－マンガン（Ｍｎ）やタングステン（Ｗ）等の金属ペーストを印刷塗布するとともに、このセラミックグリーンシートに適当な打ち抜き加工を施し、これを複数枚積層し、約１６００℃の温度で焼成することによって製作される。

【００２６】なお、このメタライズ層１ｂを成す金属ペーストは、例えばモリブデン－マンガンの場合、モリブデン、マンガンのような高融点金属粉末に適当な有機バインダ、溶剤等を添加混合することによって得られる。

【００２７】また、このメタライズ層１ｂは、その表面に耐蝕性に優れかつロウ材との濡れ性に優れる金属、具体的には厚さ０．５～９μｍのニッケル（Ｎｉ）層をメッキ法により被着させておくと、基体１とシールリング２、リード端子４との銀ロウ等のロウ材による接合、および、半導体素子６と載置部１ａとの鉛（Ｓｎ）－鉛（Ｐｂ）半田等の低融点半田による接合を可能にする、所謂メタライズ接合層として機能する。また、このニッケル層の表面にさらに厚さ０．５～９μｍの金層をメッキ法により被着させることによって、半導体素子６とボンディングワイヤ５との電気的接続を可能にする電気的接合層として機能する。

【００２８】シールリング２は、Ｆｅ－Ｎｉ－Ｃｏ合金等の金属材料から成り、基体１の熱膨張係数に近似したものを用いることによって、基体１の上面に載置部１ａおよび凹部を囲繞するように銀ロウ等のロウ材で接合した後の、熱膨張差による歪みを極めて小さいものとし、その結果それらの接合を強固なものとできる。

【００２９】このシールリング２は、そのインゴットに圧延加工や打ち抜き加工等の従来周知の金属加工を施すことによって所定の形状に製作される。また、その表面に耐蝕性に優れかつロウ材との濡れ性に優れる金属、具体的には厚さ０．５～９μｍのニッケル層をメッキ法等により被着させておくと、基体１上面との銀ロウ等による接合をより強固なものとできる。

【００３０】このシールリング２上面には、サファイアガラス等から成る透光性部材の周縁部に形成された金属膜を介して、Ｆｅ－Ｎｉ－Ｃｏ合金等から成る金属フレームを接合した蓋体３が、シーム溶接等の溶接によって接合される。

【００３１】この蓋体３は、その主面に開けられた窓部に透光性部材が設けられ、かつ半導体素子６を封止するように凹部を覆って基体１の上面に接合される。これにより、内部に収納された半導体素子６を気密に封止する機能を有するとともに、透光性部材に紫外線等の外光を透過させ半導体素子６に外光を伝達する所謂光透過窓としての機能を有する。また、蓋体３全体がサファイアガラス等の透光性部材から成っていてもよい。

【００３２】また、この蓋体３の透光性部材がサファイアガラスから成る場合、その熱膨張係数が約５×１０$^{-6}$／℃（室温～４００℃）であるため、熱膨張係数が４×１０$^{-6}$～５×１０$^{-6}$／℃程度（室温～４００℃）のＦｅ－Ｎｉ－Ｃｏ合金から成る金属フレームとの熱膨張係数が近似し、それらの接合を非常に強固なものとできる。

【００３３】この蓋体３の金属フレームは、そのインゴットに圧延加工や打ち抜き加工等の従来周知の金属加工を施すことによって所定の形状に製作される。また、その表面に耐蝕性に優れかつロウ材との濡れ性に優れる金属、具体的には厚さ０．５～９μｍのニッケル層と、厚さ０．５～９μｍの金層をメッキ法により被着させることによって、透光性部材の周縁部の金属膜に金（Ａｕ）－錫（Ｓｎ）等の低融点ロウ材で強固に接合される。

【００３４】この蓋体３の透光性部材は、不活性ガスが紫外線等による外光によって変質し蓋体３の透光性部材の内面側（凹部側）へ付着するのを、基体１に形成された不活性ガス循環用の貫通孔１ｃが有効に防止するため、透明度の非常に高い状態を維持できる。

【００３５】このように、蓋体３の透光性部材を透過する外光は、基体１の凹部内の不活性ガスを変質させることなく、凹部内に収納されたいかなる大きさの半導体素子６にも十分に照射される。そのため、半導体素子６と外光との結合効率を十分に確保でき、また半導体素子６に記憶されている信号、データ等の消去を十分なものとでき、その結果半導体素子６を長期間にわたり正常かつ安定に作動させ得る。

【００３６】かくして、本発明の半導体パッケージは、上面に凹部が形成され、凹部底面に方形状の半導体素子６を載置する載置部１ａが設けられた基体１と、半導体素子６を封止するように凹部を覆って上面に接合される透光性の蓋体３とを具備したものであり、半導体素子６を気密に封止するために封入した窒素ガス、アルゴンガス等の不活性ガスの漏洩を可能にするために、基体の上面から凹部の内側面にかけて貫通する少なくとも２つの貫通孔１ｃが形成されるとともに、２つの貫通孔１ｃの内側面側の各開口が半導体素子６の略対角線の延長線上に対向して設けられている。

【００３７】これにより、不活性ガスが紫外線等による外光によって変質し蓋体３の透光性部材の内面側へ付着するのを有効に防止でき、透明度の非常に高い状態を維持した透光性部材を有する蓋体３を得ることができる。その結果、この蓋体３を透過する外光によって半導体素子６を長期間にわたり正常かつ安定に作動させ得る。

【００３８】このように、基体１、シールリング２、蓋体３とで、半導体素子６を半導体パッケージ内部に収容するとともに、貫通孔１ｃに不活性ガス循環用パイプを

接続することによって、半導体素子６が半導体パッケージ内部に気密に収容され、基体１の凹部内で不活性ガスを循環させ得る。また、ボンディングワイヤ５とリード端子４と半導体素子６とを電気的に接続し、外部から蓋体３の透光性部材を通して外光を透過させることによって、半導体素子６がその外光を受信し作動したり、外部の映像を取り込み信号化したり、半導体素子６に書き込まれ記憶されている信号、データ等の消去等を良好に行うことができる半導体装置となる。

【００３９】なお、本発明は上記実施形態に限定されず、本発明の要旨を逸脱しない範囲内において種々の変更を行うことは何等支障ない。

【００４０】例えば、貫通孔１ｃは、メタライズ層１ｂが被着形成されていない基体１の側部から基体１の内部にかけて貫通するように形成されていても良く、この場合、積層されるセラミックグリーンシートに貫通孔１ｃを形成するための加工を施す作業効率が良くなるとともに、不活性ガス循環用パイプを接続する際に、この不活性ガス循環用パイプが基体３やリード端子４に接触し、それらを破損させる危険性を回避し易くなる。

【００４１】また、本発明の半導体素子６は、ＣＣＤ，ＰＤ，ＥＰＲＯＭ等の受光型のものに限らず、ＬＤ（半導体レーザ）等の発光型のものであってもよい。

【００４２】【発明の効果】本発明は、基体の上面から凹部の内側面にかけて貫通する２つの貫通孔が形成されるとともに、貫通孔の凹部の内側面側の各開口がそれぞれ半導体素子＊＊の略対角線の延長線上に対向して設けられていることにより、不活性ガスが紫外線等による外光によって変質し蓋体の透光性部材の内面側へ付着するのを有効に防止でき、透明度の非常に高い状態を維持した透光性部材を有する蓋体を得ることができる。その結果、この蓋体を透過する外光によって半導体素子を長期間にわたり正常かつ安定に作動させ得る。

【００４３】また、本発明は、貫通孔の凹部の内側面側の各開口下端は、半導体素子の上面よりも高くかつ上面から５ｍｍまでの高さに設けられていることにより、不活性ガスを貫通孔より基体の凹部内に速やかに潤滑なく供給し、また速やかに排出し易いものとなる。

【図面の簡単な説明】

【図１】本発明の半導体パッケージの一実施形態を示す断面図である。

【図２】図１の蓋体を除く基体の平面図である。

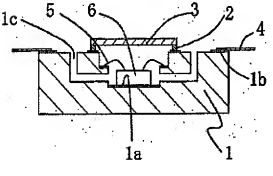
【図３】従来の半導体パッケージの断面図である。

【図４】本発明の半導体パッケージの他の実施形態を示す断面図である。

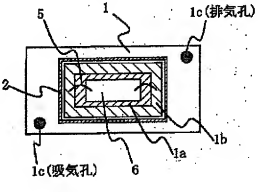
【符号の説明】

１：基体
１ａ：載置部
１ｃ：貫通孔
２：シールリング
３：蓋体
６：受光型の半導体素子

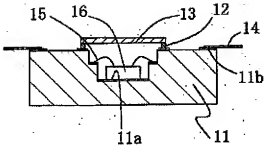
【図１】



【図２】



【図3】



【図4】